Issued February 4, 1910.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY—Circular No. 45.
B. T. GALLOWAY, Chief of Bureau.

THE UTILIZATION OF PEA-CANNERY REFUSE FOR FORAGE.

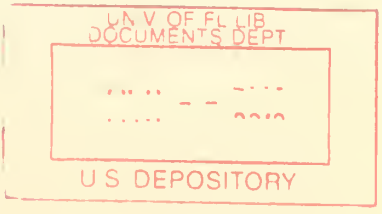
BY

M. A. CROSBY,

Assistant Agriculturist, Office of Farm Management.

[9911 10

WASHINGTON: GOVERNMENT PRINTING OFFICE: 1910



BUREAU OF PLANT INDUSTRY.

Chief of Bureau, BEVERLY T. GALLOWAY.
Assistant Chief of Bureau, ALBERT F. WOODS.
Editor, J. E. ROCKWELL.
Chief Clerk, JAMES E. JONES.

[Cir. 45]

THE UTILIZATION OF PEA-CANNERY REFUSE FOR FORAGE.

INTRODUCTION.

Most of the peas grown for canning purposes are produced in the States of New York, Wisconsin, Indiana, Ohio, Illinois, Michigan, New Jersey, and Maryland. This branch of the canning industry has made great growth during the past few years and is being rapidly extended to new territory, especially in those States where it is already established.

In the early days of the pea-canning industry it was the practice to pick the green pods from the vines and shell them by hand, a slow and laborious process. With the invention of the "viner," a machine for thrashing peas out of the green pods, hand shelling has been largely done away with and the canning industry given a tremendous impetus. Where these viners are used, the peas can be cut with a mower, hauled to the cannery, and thrashed while green. This leaves the canner with a large quantity of refuse vines to be disposed of in some way.

When the growing of peas for canning purposes first began to be extensively engaged in, the feeding value of the refuse vines was not fully appreciated and the canners experienced no little difficulty in keeping the factories free from this waste. At some factories the canners required the farmers who were growing peas for them to take away a load of vines for every load of peas hauled to the cannery. At others the vines were dumped in piles near the factory and later hauled out for manure. When these waste vines were allowed to accumulate in loose piles near the factory a rapid decomposition would set in, and the stench from this decaying mass of vegetable matter would be almost unbearable. As a result of this condition the refuse vines were often hauled out and dumped in immense piles at some distance from the factory and later hauled away by the farmers and used as a fertilizer. This practice is still in vogue in some sections where the feeding value of the vines is not yet appreciated.

The dumping of vines in large piles soon led to the discovery that quite a percentage of the vines thus handled was preserved like silage

and greedily eaten by stock, especially cattle and sheep. The larger the pile of vines and the more they were trampled in piling the smaller the percentage of spoiled material. From this discovery developed the practice of stacking the vines in order to save them, when previously the only question to be solved was how to get rid of them. When the vines are carefully put up in large, well-trampled stacks, the decomposition is reduced to a minimum and the unpleasant odor is much less in evidence, thus making it possible to stack them quite near the cannery without disagreeable results.

In other sections a short hay crop led the farmers to undertake curing pea vines for hay, and they soon discovered that the valuable forage thus secured paid them handsomely for their trouble.

PRESENT METHODS OF UTILIZING THE REFUSE VINES.

Several methods of utilizing refuse pea vines are in use at present. These are as silage, as hay, as a green feed or soiling crop, and as a fertilizer. During the season of 1908 a large amount of data on methods of utilizing this by-product was obtained from canners, farmers, and feeders throughout the pea-growing sections. The data obtained show that 96 canneries handled the peas grown on a total of 65,959 acres, and that the refuse vines from 40,518 acres, or 61 per cent of the total, were used as silage; from 13,785 acres, or 21 per cent, as hay; from 7,731 acres, or 12 per cent, as a green feed or soiling crop, and that from the remaining 3,925 acres, or 6 per cent, the refuse vines were either used as a fertilizer or thrown away.

PEA-VINE SILAGE.

From the figures just presented it is evident that the most popular method of using pea vines is as silage, and where the cannery is located in a dairy section this is almost universally the system in practice. The same statement is also true for some of the sections where sheep and cattle feeding are popular industries.

There are two ways of making silage from pea vines, i. e., in large stacks and in silos. The practice of putting the vines in large stacks is the one most commonly employed, especially where practically all the vines from a cannery are handled by the canner or by one or two other persons. At many factories it has become a custom for the canners to put the vines up in stacks or silos and either to sell the silage to farmers and feeders in the winter or to buy stock and feed it out themselves, thus realizing a profit on what was formerly a waste product. At other factories one or more farmers or stock feeders will contract to keep the refuse vines cleared away for what they can get out of them. Still another practice is for the farmer who brings

a load of peas to the factory to take home his quota of vines, just as the dairyman takes his load of whole milk to the creamery and then takes the separated milk home to feed.

Where a large quantity of vines is to be put up for winter feed by one man and care is exercised in having the stacks well built, well drained, and thoroughly packed, the stacking method is undoubtedly the most economical way of handling the vines. With proper care the vines from 300 acres or more can be stacked with very little loss, and it is doubtful whether it would pay to go to the expense of constructing silos where this quantity is to be handled. Careless stacking, though, will invariably result in the loss of a lot of valuable feed. Smaller quantities than that mentioned can probably be most economically saved in a silo, and many who have tried both methods favor the latter under all circumstances.

FIG. 1.—Stacks of pea-vine silage, showing the sloping sides where the vines are carted to the top of the stack.

At some factories the vines are put into large stacks, one side of which is left sloping (see fig. 1), so that a cart loaded with vines may be drawn up and the horse and cart driven around on top of the stack, thus thoroughly compacting the vines. At other factories the vines are conveyed directly to the stack by means of a carrier (see fig. 2) and trampled by the men who are doing the stacking. The stacks should always be well drained underneath, so that the surplus juice may ooze out and be carried away in ditches. When properly built and well packed only about 8 inches of the outside mass will spoil.

Where the vines are kept in the silo they may be put in just as they come from the viner or they may be run through a silage cutter first. When they are put in as they come from the viner they require more

trampling and packing than when run through the cutter. The silo should always be filled as rapidly as possible, for if the filling extends over a period of several weeks, the length of the pea-canning season, the silage will spoil and be unfit for feeding. For this reason it will hardly be practicable for a farmer or dairyman who lives at some distance from the cannery to put the vines in a silo unless he has plenty of teams and labor and can get all the vines he needs.

FEEDING VALUE OF THE SILAGE.

The silage made from the refuse pea vines is generally regarded as possessing a high feeding value for dairy cows and other animals when a succulent feed is desired. There is some difference of opinion, however, regarding its value as compared with corn silage. Most dairymen who have had extensive experience in feeding both are of

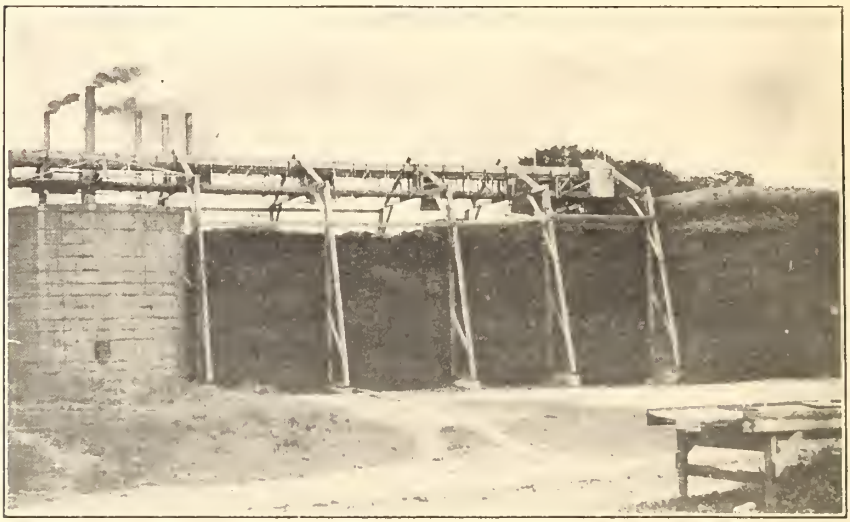


FIG. 2.—Stacks of pea-vine silage, showing the carrier used for conveying the vines to the stack.

the opinion that the pea-vine silage produces a greater flow of milk than does corn silage. On the other hand, a few contend that when a change is made from corn silage to pea-vine silage there is always a perceptible falling off in the milk production. The latter, however, are decidedly in the minority. Some cases of this nature were found to be due to the fact that the pea-vine silage was partially spoiled, and it is possible that all unfavorable results could be traced to similar conditions.

The following table shows the composition of pea-vine silage from different sources in comparison with corn silage.

TABLE 1. *Composition of corn silage and pea-vine silage.*

Kind of silage	Moisture.	Protein.	Fat.	Fiber.	Nitrogen-free extract.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Corn (immature corn) [a]	71.46	2.58	0.97	6.91	16.64	1.44
Corn (mature corn) [a]	64.43	2.58	1.25	8.39	22.04	1.31
Pea vine [a]	67.37	3.59	1.29	8.64	15.35	3.73
Pea vine [b]	72.80	3.65	.86	9.62	10.97	2.10

[a] Annual Report, Wisconsin Agricultural Experiment Station, 1904.
[b] Analysis by Prof. George W. Cavanaugh, Cornell University, Ithaca, N. Y.

It will be seen that pea-vine silage is richer in protein than is corn silage, about the same in fat, but not quite so rich in nitrogen-free extract.

PEA-VINE SILAGE FOR DAIRY COWS.

The results of few carefully conducted feeding experiments with pea-vine silage for dairy cows are recorded. Mr. Joseph Gerber, who owns a small dairy in Fremont, Mich., conducted a ninety-day test with corn silage, pea silage, and clover hay, feeding twelve cows during the entire test 4 pounds a day of a mixture of equal parts of corn meal and oil meal. The silage and hay were not weighed, but the animals were allowed to have what they would eat up clean. The milk was separated and the cream sold. No record was kept of the milk produced, the receipts for cream only being taken into consideration.

For the first thirty-day period, ending March 31, the cows were fed on corn silage and the receipts for cream were $87. For the next thirty days they were fed pea-vine silage and the receipts for cream were $96. During the last thirty-day period clover hay was fed and the receipts for cream were only $66. These results show a slight increase in favor of pea-vine silage over corn silage.

Pea-vine silage is especially valuable for late summer feeding, when pastures are short and before new corn silage is available. A prominent Michigan dairyman states that as a result of three years' experience he is satisfied that pea-vine silage is as good or better than corn silage, provided it is properly kept. He prefers it to corn silage for summer feeding. One year he fed about 75 tons, with good results.

In some localities where the canners are selling silage the farmers are hauling it as many as 7 miles to feed their dairy cows and are getting considerably increased yields of milk. In some cases they report getting one-third more milk by feeding the silage.

A New York dairyman states that in his experience when pea silage is fed with the same quantity of grain it will produce more milk than corn silage. He does not consider it as good for other

stock, with the exception of sheep, as corn silage. He winters about 50 head of cattle and when spring comes they are always in good condition. The only objection he has to the silage is the bad odor and the fact that it is very heavy to handle.

The principal objection raised to pea-vine silage is that it sometimes taints the milk. This may be prevented by postponing feeding until after milking.

Another dairyman states that he secured the best results by alternating pea-vine silage with corn silage, feeding one for two or three weeks, then changing to the other. The pea-vine silage invariably increased the flow of milk, but also tended to decrease its keeping qualities.

PEA-VINE SILAGE FOR BEEF CATTLE.

Pea-vine silage has little value as a fat producer, but regardless of this fact it is very highly regarded as a supplementary feed for beef cattle. Quite a number of feeders are using the silage, and almost invariably they claim that their cattle keep in much better condition than where no silage is fed. One New York canner writes that he annually feeds from 250 to 275 steers on the refuse vines from his factory. He begins feeding silage with a little corn meal in the winter. The amount of meal is gradually increased until the animals are on a full ration. They are usually finished off and ready for beef early in June.

The following is extracted from a letter from a canning company at Rome, N. Y.:

> We have used the silo for many years in which to preserve this by-product. We grow from 700 to 1,000 acres of peas in connection with our plant, and the waste from this, as well as from what the farmers grow for us, we find very valuable for both horses and cattle. We use no hay whatever in feeding our stock, including the work horses, and they seem to enjoy the feed and thrive on it. In the fall we usually purchase several hundred head of cattle, which we winter, feeding them on silage exclusively. In this way we secure fertilizer to assist in keeping up our farm. The farmers in the vicinity would be glad to buy all the silage we have, but we prefer to keep the manure for our farms. We have handled this waste in silos and by other methods for many years, and after varied experiences have finally concluded that this is the best method.

PEA-VINE SILAGE FOR SHEEP.

In many sections of New York and Wisconsin pea-vine silage has come to be very highly regarded as a feed for sheep. In Wisconsin a large number of lambs and wethers that are being fattened for the market are fed on this silage in preference to any other roughage. The common practice is to take the sheep off of the pastures about the 1st of November and put them on a ration of silage and corn meal. At first they are given about 10 pounds of silage and from one-half to 1 pound of meal each day. The quantity of silage is

gradually decreased and the meal increased, until at the end of thirty or forty days they are getting 6 pounds of silage and about 2 pounds of corn meal. It generally takes from forty to fifty days to fit sheep for the market on a ration of this kind. The silage is not credited with having any particular value as a fat producer. Its great value lies in the fact that it keeps the animals in good condition, so that they can better assimilate the grain.

It seems to be quite generally conceded that a fine quality of mutton is produced by feeding pea-vine silage that is well kept. In the fall of 1908 a lot of 442 western wethers that had been fed on pea-vine silage and corn in Wisconsin for fifty days topped the Chicago market for heavy export sheep the day they were sold.

Pea-vine silage is an excellent winter feed for breeding ewes. Its laxative qualities keep the bowels in good condition and it produces a large flow of milk. Some sheep breeders who have had quite an extensive experience in feeding this silage prefer it to anything else they can get for their breeding ewes. One large breeder in western New York winters annually from 600 to 700 breeding ewes on pea-vine silage and alfalfa hay, without any grain. His ration is 6½ pounds of silage and 2 pounds of alfalfa hay for each head daily. His ewes come through the winter in fine condition, and their lambs, which come in May, are invariably strong and healthy. He states that he considers this silage superior to all other feed for breeding ewes.

Pea-vine silage has been very successfully used as an exclusive roughage ration for horses, beef cattle, and sheep. When used in this way, the animals are usually fed all they will eat up clean. Horses and cattle will consume from 40 to 80 pounds a day, while sheep will eat from 6 to 12 pounds daily.

MARKET VALUE OF PEA-VINE SILAGE.

The selling price of pea-vine silage varies considerably. Some canners put it up in stacks and sell it in the winter at $1 a load. Others sell it at from $1.50 to $3 a ton. After farmers, especially those engaged in dairying, have learned the value of this feed the canners, as a rule, can not supply the demand at $3 a ton.

PEA-VINE HAY.

The curing of pea vines for hay is a common method of handling them in many sections. This is a popular practice when the farmer is supposed to take home his quota of vines. Farmers living near the factory generally take the freshly thrashed vines home and spread them out to cure on sod land, while those who live some distance away usually spread the vines out to cure on vacant land near the factory. At some factories, if there happens to be a surplus of vines from the

peas grown, either by the farmers or by the company, these are cured by the company (see fig. 3) and sold to the farmers at about the cost of curing. This price runs from $3.50 to $4 a ton, and many farmers, especially those living some distance from the factory, prefer to pay this rather than bother with curing the vines themselves.

Pea-vine hay is greatly relished by horses, cattle, and sheep. Many dairymen prefer it to the best clover hay as a roughage for their cattle. In the winter even hogs will eat quantities of it, and it is an excellent feed for brood sows.

There is considerable difference of opinion regarding the value of the hay as compared with the silage. Men who have tried both are divided in opinion, some contending that the hay is far superior and

FIG. 3.—Curing vines for hay at a canning factory.

more economical to handle, while others claim just the opposite. It is generally conceded, however, that properly cured pea-vine hay is superior to clover hay for dairy cows. Some dairymen go so far as to say that they consider pea-vine hay worth twice as much as clover hay, but this is undoubtedly an exaggeration.

Pea-vine hay is also a good feed for work horses and mules and is especially valuable for conditioning thin, overworked animals. In giving his experience with pea-vine silage and hay, Mr. J. F. Guenther, of Owensboro, Ky., made the following statement:

We used a large silo and put our pea vines in it the first year we packed peas. We found that neither farmers nor dairymen would buy our silage from us. The next year we dried the pea vines and found this was much better than making silage from them. Pea-vine hay is so far superior to silage that there is no comparison. Besides,

the hay can be baled and stored away and has a market value in any section of the country, whereas you are confined to your own immediate neighborhood in the pea silage.

After getting done with our farm work we had a large number of horses and mules on hand and put them to work at railroad excavating. When they came back they were in pretty thin order and very much the worse for wear. We built a very large rack out in a lot we had, so that the mules and the horses could go to the pea vines and eat all they wanted. With the addition of a small amount of grain all the horses and mules were seal fat inside of six weeks. I have never fed anything that improved stock so rapidly as these pea vines.

CURING THE VINES FOR HAY.

In curing pea vines for hay they should be taken directly from the viner, spread out on the ground, and left during the day. The next morning, after the sun has dried the dew off, they should be thoroughly stirred up with forks or a tedder. If the weather conditions are favorable, they should be stirred up again after noon and then raked into windrows and put up in cocks. The next day they can be stacked or stored in the barn or shed. When the cured vines are stacked they should be covered with some material which will shed rain, as they readily take up water and are easily spoiled when wet.

In settled weather a good practice is to spread the vines out and let them lie in the sun for a day; then put them up in cocks and let them remain for three or four days. The cocks should be opened and the vines spread out on a bright day so as to dry out the hay in the bottom, which sometimes absorbs considerable moisture, and then hauled to the barn. Some make a practice of sprinkling 5 or 6 pounds of salt over each load as it is placed in the barn, believing that this increases the palatability of the hay.

MARKET VALUE OF PEA-VINE HAY.

It is rather difficult to determine the market value of pea-vine hay, as the greater portion of it is fed by the producer. Where it has been sold, however, the prices quoted range all the way from $4.50 to $20 a ton, the average being about $12 when clover hay is worth $10.

PEA VINES AS A SOILING CROP.

As a green feed or soiling crop the refuse pea vines are probably the equal of any crop grown. Dairymen universally agree that feeding the green vines increases the flow of milk. The use of vines as a soiling crop, however, is confined to a comparatively limited area in the immediate vicinity of a cannery or viner.

PEA VINES AS A FERTILIZER.

Pea vines have considerable value when used as a fertilizer, especially on soils that are deficient in humus. They are rich in that all-

important element of plant food, nitrogen. The following analysis was made by Prof. George W. Cavanaugh, of Cornell University:

Moisture	72.800 per cent.
Nitrogen	0.585 per cent, or 11.7 pounds a ton.
Phosphoric acid	0.111 per cent, or 2.22 pounds a ton.
Potash	0.432 per cent, or 8.64 pounds a ton.

At current prices the fertilizing value of 1 ton of pea vines would be as follows:

Nitrogen, 11.7 pounds, at 18 cents a pound	$2.11
Phosphoric acid, 2.22 pounds, at 4½ cents a pound	.10
Potash, 8.64 pounds, at 4½ cents a pound	.39
Total value per ton	2.60

From these figures it will be seen that the refuse vines have a fertilizing value of $2.60 a ton, which makes them well worth using for this purpose. It would be much better economy, however, to feed the vines either as a soiling crop, as silage, or as hay, and to save the droppings from the animals fed, in this way serving a twofold purpose. As but a small part of the fertilizer constituents is lost in passing through an animal, the droppings, if carefully saved, are nearly as valuable for fertilizing as the whole vines.

SUMMARY.

The refuse vines from pea canneries are valuable as silage, as hay, as a soiling crop, and as a fertilizer. Their use as silage is the most general practice. They may be ensilaged either in a silo or in a stack.

Pea-vine silage compares very favorably with corn silage and by many is regarded as superior, especially for dairy cows. It is also valuable for beef cattle and sheep and is sometimes fed to horses, mules, and hogs. It has been successfully used as an exclusive roughage for dairy and beef cattle, sheep, and even horses.

Pea-vine hay is a valuable feed for all classes of stock. It is of exceptional value for milch cows and sheep and for conditioning thin stock, especially horses and mules. It is generally considered to be equal or even superior to clover hay.

Pea vines are valuable as a soiling crop, but their use as such is limited to the immediate vicinity of the cannery or viner.

As a manure, pea vines have an actual fertilizer value of about $2.60 a ton.

Approved:

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *December 3, 1909.*

[Cir. 45]

O